



# CANADIAN ARTHRITIS FUNDING LANDSCAPE REVIEW



## Commissioned by:

Canadian Arthritis Network (CAN), The Arthritis Society (TAS), the Institute of Musculoskeletal Health and Arthritis (IMHA) at the Canadian Institutes of Health Research (CIHR), and the Alliance for the Canadian Arthritis Program (ACAP).



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Report prepared by:

# Overview and Methodology

Canada's leading arthritis research organizations—Canadian Institutes of Health Research-Institute for Musculoskeletal Health and Arthritis (CIHR-IMHA), The Arthritis Society (TAS), Canadian Arthritis Network (CAN) and the partner organizations making up the Alliance for the Canadian Arthritis Program (ACAP)—have come together in a fact finding exercise aimed at understanding the arthritis funding landscape related to research.

SHI Consulting (SHI) was engaged to assess the arthritis research landscape through consultations with twenty-five national stakeholders and seven global opinion leaders. In parallel, SHI worked with TAS, CIHR-IMHA and CAN to construct an arthritis funding database detailing 843 grants worth over \$206 million from 21 different funders/organizations over the period 2005 to 2010. These records were scored by SHI, CIHR-IMHA, TAS and CAN and independently reviewed and validated by three reviewers from CIHR-IMHA, TAS and ACAP.

This summary evaluates Canada's strengths, needs, and challenges in the global context of the disease, and is intended to inform and support strategy development and partnering by Canadian arthritis funding organizations.

It is important to note that this report is only one piece of information for decision making related to Canada's arthritis research capacity. It is the first step towards a broader examination of research impact, which the sponsors of this work hope to undertake according to the Canadian Academy of Health Sciences research impact framework<sup>1</sup>. While this study touches on research productivity as measured by publications and citations, broader measures of research impact were considered beyond the scope of this report.

<sup>1</sup> Panel on Return on Investment in Health Research, 2009. Making an Impact: A Preferred Framework and Indicators to Measure Returns on Investment in Health Research, Canadian Academy of Health Sciences, Ottawa, ON, Canada

Important notes on methodology:

- 1) In the analysis of the level of investment, the full value of multi-year grants was attributed to the year in which grants were awarded; given limitations of the available data, funds were not annualized according to the disbursement schedule across the duration of the award.
- 2) For the purposes of this analysis, and unless otherwise indicated, we have removed large grants to the Canadian Arthritis Network (CAN) in order to avoid the double-counting of CAN's reported disbursements. These grants include: CIHR \$22,402,250 in 2005; SSHRC \$4,073,000 in 2006; and NSERC \$700,000 in 2006. The total reported value of CAN disbursements in the database is not equal to these aforementioned grants; the gap likely reflects both the annual operating cost of CAN's administration (not reported in the database) and incomplete financial data for a small subset of training grants.

The underlying study and preliminary analysis of data presented in this document were performed by SHI Consulting under contract by IMHA, TAS, and CAN, which along with other organizations comprise the ACAP Research Committee. The current version of this document was edited, validated and approved by a subset of leaders of the respective Partners.

# Key Messages Arising from the Research Funding Database

## EVOLVING FUNDING LANDSCAPE

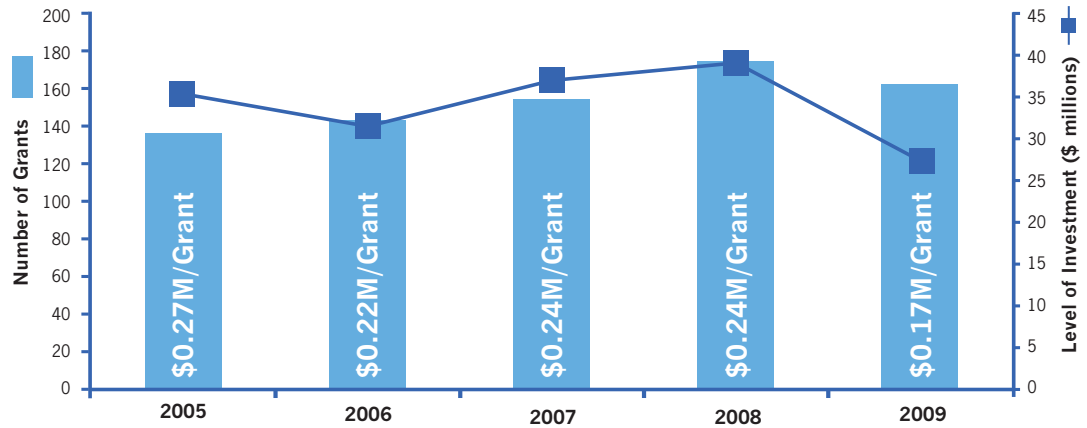
*How is the Canadian Arthritis Funding environment changing and what are the salient overarching trends that bear attention for ensuring Canada's capacity to perform world-class research in Arthritis?*

1. **After a documented period of growth (2000-2005), our review found that arthritis research funding has plateaued in 2005-2009 (Figure 1).** CIHR is the largest funder of arthritis research in Canada providing 57% of total funding (\$117 million). Other major arthritis research funders include: Canada Research Chairs (CRC) (\$24 million), TAS (\$17 million), Arthritis and Autoimmune Research Centre Foundation (AARCF) (\$13 million), CAN (\$12 million), Alberta Innovates (AI) (\$5.6 million), and Natural Sciences and Engineering Research Council of Canada (NSERC) (\$3.6 million). An analysis of grants from all funders during the period 2005 to 2009 indicates that total funding levels have stabilized and there has been a decline in the average value per award. The number of grants funded by CIHR has increased over this period from 68 grants in 2005 to 91 grants in 2009, while the overall level of investment<sup>2</sup> has declined from \$18.8 million in 2005 to \$16.5 million in 2009, resulting in a reduction in the average value per grant (\$0.27 million per grant in 2005 vs. \$0.17 million per grant in 2009). Notwithstanding a potential gap arising from the end of CAN, the significance that this trend represents is not clear, given the limited time period of analysis, variability arising from large one-time grants, and the impact of leveraged funding.

<sup>2</sup> As measured by CIHR operating grants.

**Figure 1**

**TOTAL INVESTMENT FOR ARTHRITIS-RELATED RESEARCH (2005-2009)**



**2. CAN has administered at least \$12.3 million<sup>3</sup> in funding to the field from 2005 to 2010, and in the process created a model for assembling collaborative teams and coordinating funding from other organizations around consensus driven strategic priorities.**

As CAN winds down, much of the new money that has been generated for arthritis research and development, as well as the infrastructure developed to support training and networking/partnerships, is at risk. CAN has been important to the arthritis research community in Canada, earning international recognition for enhancing multi-site, interdisciplinary collaborations, partnerships with industry, the translation of discoveries to application, and the involvement of consumers in the research agenda. Overall, as a result of creating a vehicle to bring together multi-disciplinary researchers across Canada, CAN was able to mobilize arthritis research and attracted investment from public and private sources. While the collaborative teams created by CAN will continue in the near term, to maintain the culture of collaboration created through CAN, additional resources will need to be mobilized to nurture the development of new teams.

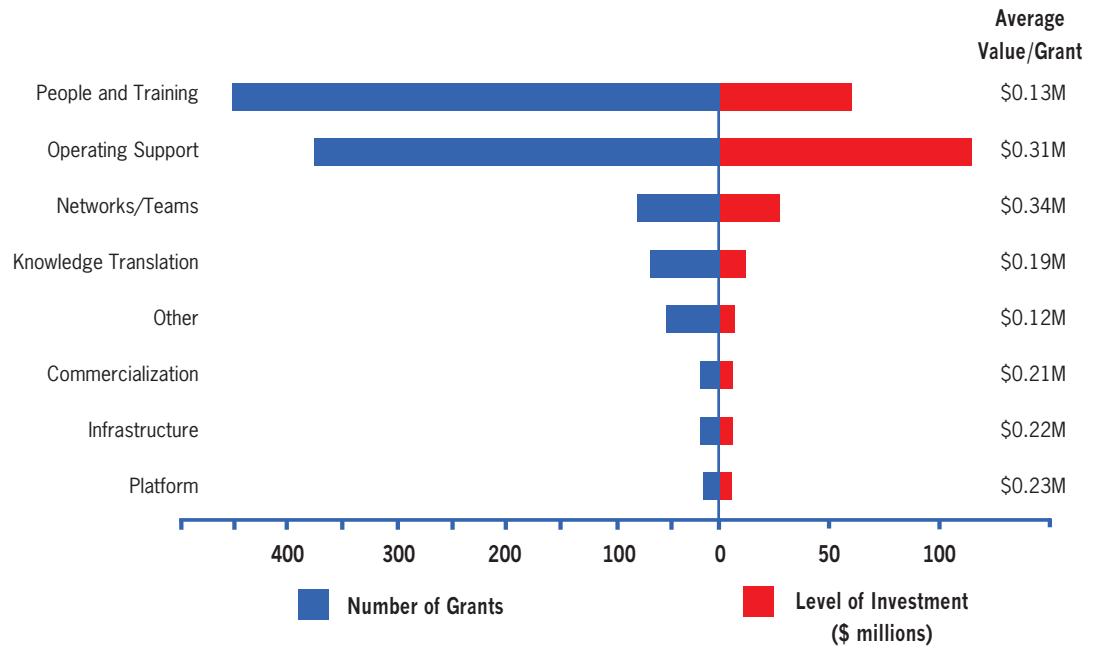
**3. The current study suggests a similar funding pattern among major funders (Figure 2).**

An analysis of the research funded by the major research funders involved in this study demonstrated similar emphases given to different targets of funding (operating support, salary support, infrastructure, etc). For instance funding agencies all fund operating grants while only some agencies fund networking and knowledge translation grants. The arthritis community needs to reflect on whether or not this similar pattern of funding has inadvertently created gaps.

<sup>3</sup> \$2.5 million of the total amount originated from TAS as part of trainee support (\$0.5M/year).

**Figure 2**

**DISTRIBUTION OF ARTHRITIS-RELATED RESEARCH FUNDING BY TARGET AREA (2005-2010\*)**



N.B. –Analysis is based on the distribution of target areas for data in the Arthritis Research Funding Database 2005-2010. These data exclude 42 records without a value of investment: CAN (17), CIORA (15), FRSQ (2), MSFHR (3), NIH (2), NSHRF (2), MOHLTC (1). \* 2010 data are incomplete.

**4. Partnerships leveraged at least \$7.0 million in support from industry (\$2.2 million in in-kind contributions and \$4.8 million in cash contributions) for arthritis research. There is a need to engage additional partners.** Successes in leveraging investment from the private sector to date must continue in order to support future growth. From 2005-2010, CAN successfully attracted at least \$4.0 million in industry support (in-kind and cash), which represents 57% of total industry contributions identified by this study during the period 2005 to 2010. The study authors noted challenges in collecting information on partner funding contributions. In particular, industry-sponsored investigator-initiated grants were not available to be included in this study. It is suggested that partner funding is significantly underrepresented and that funders should consider a systematic way to collect and catalogue funding data.



## BALANCE

*To what extent is there an appropriate balance of Arthritis research funding in Canada?*

5. **The number of grants and funding directed to osteoarthritis were comparable with levels of funding in rheumatoid arthritis and second highest among arthritis disease sub-types in 2005-2010. However, given the much greater prevalence of osteoarthritis compared to other disease sub-types<sup>4</sup>, osteoarthritis remains an area in need of ongoing research investment.**

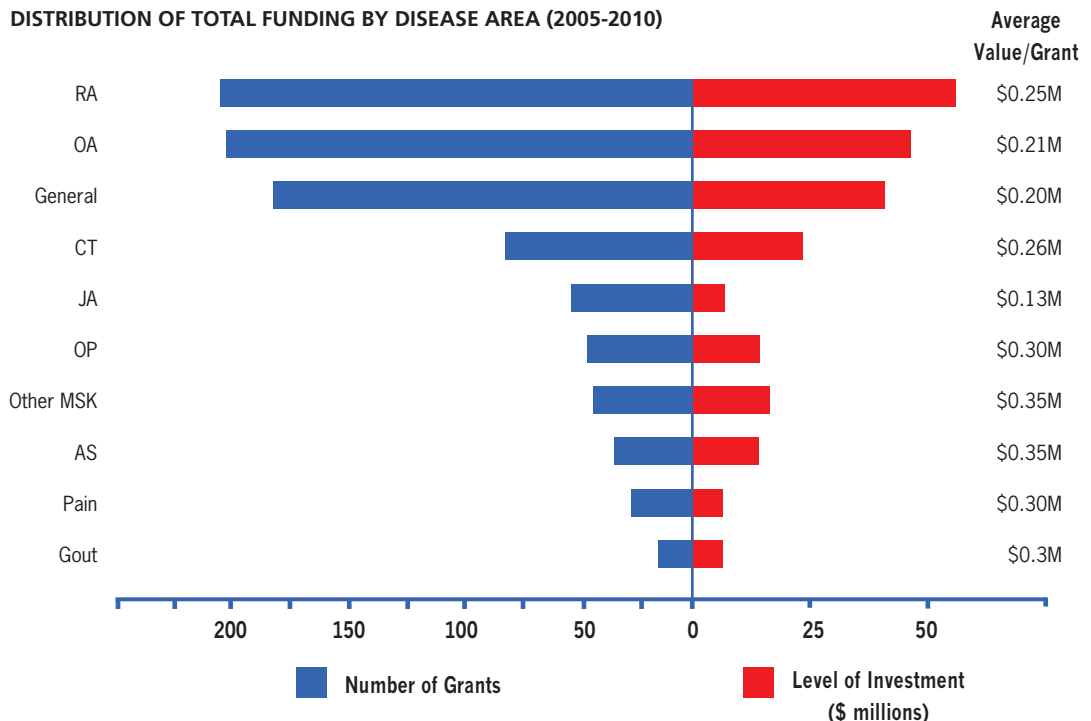
Traditionally Canadian arthritis research has focused on rheumatoid arthritis, with an increasing investment in osteoarthritis research in recent years. This is consistent with other international trends. Osteoarthritis has long been recognized as a gap and was one of CAN's early priority areas. For the grants identified in this study between 2005 and 2010, 350 grants were directed at osteoarthritis, compared to 343 for rheumatoid arthritis, with an average value per grant of \$210,000 and \$250,000 for OA and RA, respectively. The current study suggests that although osteoarthritis research has benefited from increased<sup>5</sup> attention, the case for continued research emphasis in this area remains.

<sup>4</sup>The prevalence of Osteoarthritis is >10% among Canadian adults, compared with 3% for Gout, and 1% or less for other arthritis disease subtypes according to data presented by PHAC in "Life with Arthritis in Canada: a personal and public health challenge" (2010).

<sup>5</sup> It is important to note that distribution of funding across disease areas was not compared to the previous period due to limitations in the available data.

**Figure 3**

### DISTRIBUTION OF TOTAL FUNDING BY DISEASE AREA (2005-2010)



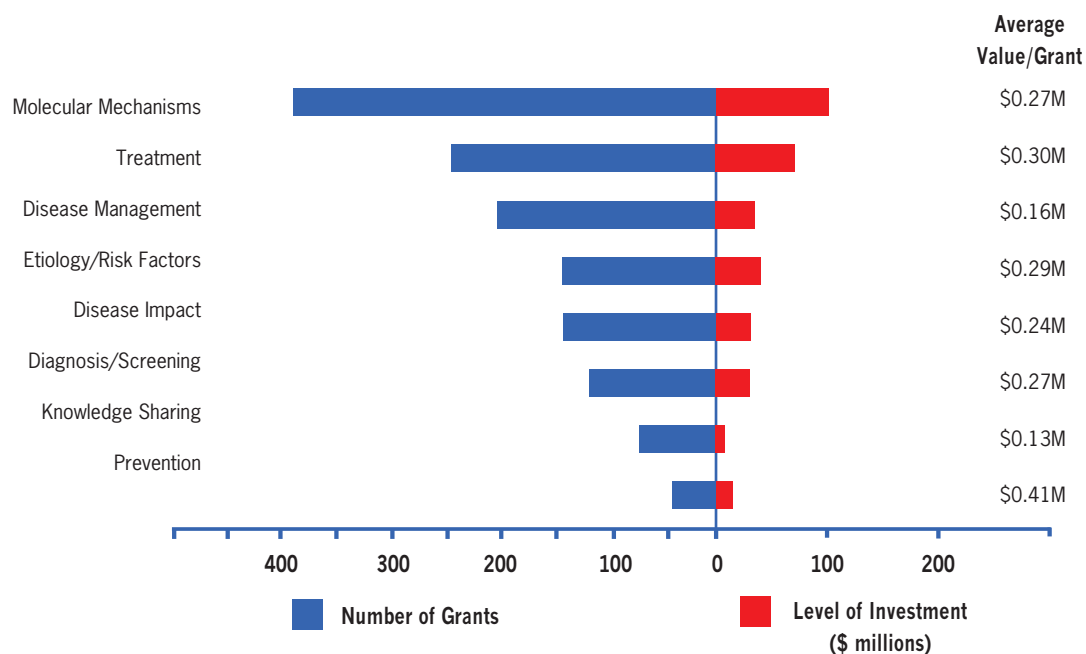
N.B – Analysis includes data from the Arthritis Research Funding Database 2005-2010, excluding 70 CAN training grants and 26 TAS grants that were not scored by disease area. Excludes 42 records without a value of investment: CAN (17), CIORA (15), FRSQ (2), MSFHR (3), NIH (2), NSHRF (2), MOHLTC (1).

\*2010 data are incomplete.

6. **Most research over the last five years has focused on understanding mechanisms of disease, treatment, and disease management/quality of life: there were fewer projects related to prevention and diagnosis or screening (Figure 4).** The current study found that from 2005 to 2010, molecular mechanisms were the most commonly funded area of research, with more than 450 grants. In contrast, prevention research was the least funded area of research with a mere 47 grants over the same period. This trend was observed for all arthritis research funders.

**Figure 4**

**DISTRIBUTION OF TOTAL FUNDING BY IMPACT AREA (2005-2010\*)**



N.B. - Analysis is based on total number of grants and level of funding from the Arthritis Research Funding Database 2005-2010, excluding 71 CAN training grants, 5 Lupus Ontario grants, 1 Pfizer grant and 7 TAS grants that were not scored by impact area. This analysis also excludes 42 records without a value of investment: CAN (17), CIORA (15), FRSQ (2), MSFHR (3), NIH (2), NSHRF(2), MOHLTC (1). \*2010 data are incomplete.

7. **Investment in Social, Cultural, Environmental, and Population Health, as well as in Health System research, has not been matched by support for training in these areas.** Increases in research activity may have been made possible through pre-existing capacity being diverted from other areas of research to arthritis.

- 8. Investment in trainees has not been followed by similar investment in early and mid-career support.** The community of funders has supported an estimated 250 individual trainees<sup>6</sup> from 2005 to 2010, a \$12.2 million investment representing 20% of all training and career support. In comparison, new investigators received only \$1.7 million in salary awards (7 grants representing 2.8% of all training and career support), while mid- to senior-level scientists received \$3.65 million (17 grants representing 6% of all training and career support); the Canada Research Chairs program, which supports a mix of early-career and established scientists, accounted for \$24.3 M over the same period (27 grants representing 40% of all training and career support)<sup>7</sup>. The arthritis community needs to reflect on whether or not training support has been unevenly distributed across areas of research and will result in decreased capacity in the future, and whether funding is appropriately distributed across the career development lifecycle (i.e., supports individuals who have completed training as they step into the role of young investigators).
- 9. Funding levels are reasonably distributed on a per capita basis across the larger provinces.** On a per capita basis, funding levels are relatively equal across the country. For example, from 2005-2010, Ontario received \$5.5 million of investment per million people, British Columbia received \$4.5 million, Alberta received \$5.9 million and Quebec received \$4.5 million. However, principal investigators on network grants are clustered by region.
- 10. Overall, while the prevalence and economic burden of arthritis are growing, arthritis research is also underfunded when compared to other disease research.** As illustrated by recent data from the Public Health Agency of Canada<sup>8</sup>, musculoskeletal disease is the disease category with the highest cost due to illness, with particularly high indirect costs to society. Within this category, arthritis contributes 53% of the direct costs and 29% of the indirect costs. The Canadian Institutes of Health Research (CIHR) spent \$19 million on arthritis-related research in 2005-2006, representing just \$4.30 for every person with arthritis. For comparison, diabetes research received three times as much funding (or about \$12.83) per person with diabetes; cancer research received 32 times as much funding (or about \$138.60) per person with cancer. Although it is difficult to directly compare the burden and costs of diverse diseases, these findings warrant greater attention in funding and policy decisions.

<sup>6</sup> Number of trainees estimate based on individuals awarded trainee grants (from a total of 297 trainee grants).

<sup>7</sup> New investigator and mid- to senior-level scientist awards were identified by program name; however, it was difficult to distinguish new from mid- to senior-level scientists from many other training/career support programs (107 awards totaling \$18 million).

<sup>8</sup> Refer to appended figures from "Life with Arthritis in Canada : A personal and public health challenge" and "2009 Tracking Heart Disease and Stroke in Canada"

## PUBLICATION PRODUCTIVITY

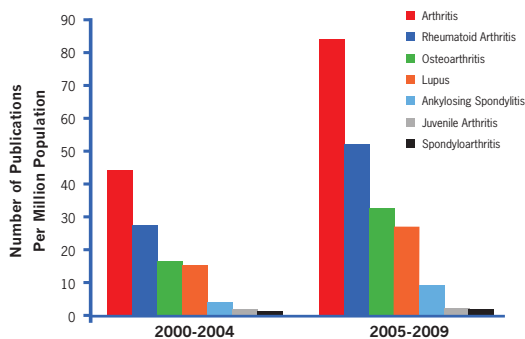
### *How does Canada's research community perform in terms of publishing leading edge research compared to their international peers?*

Publication productivity was measured by publications per capita and h-Index, which is the set of the scientist's or group of scientists' most cited papers and the number of citations that they have received in other people's publications. Bibliometric analysis searched first for diagnostic category and then by country. As was noted in the introduction, there remains a need to look at research impact and productivity more broadly, preferably as outlined in Frank *et al.* [Making an Impact: A Preferred Framework and Indicators to Measure Returns on Investment in Health Research](#).

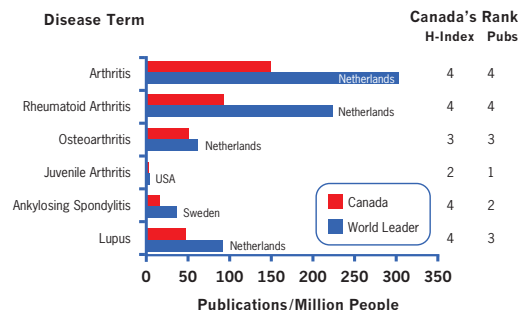
11. **Amongst six selected leading nations, Canada consistently ranks in the top 5 in terms of high levels of research publications per capita (Figure 5).** A comparison of productivity and impact factor (h-index) suggests that Canada tends to demonstrate higher levels of productivity in networked areas including juvenile arthritis (JA), spondyloarthritis, ankylosing spondylitis, psoriatic arthritis, lupus, and gout. The authors recognize that while the H-index is only one dimension of impact, it has become recognized as a global benchmark.

**Figure 5**

#### INCREASING PUBLICATION PRODUCTIVITY BY DISEASE TERM: 2000-2004 VS. 2005-2009



#### CANADA'S PUBLICATION PRODUCTIVITY 2000-2009



Canada's publication productivity was compared to the following countries: United States, England, Netherlands, Australia and Sweden.

Source: ISI Web of Science and the United States Census Bureau Population Statistics for 2009. Key word search for indicated disease term and 'Canada' for the period 2000-2009. Total number of publications are normalized per million population. The results for the search term 'Juvenile Arthritis' were augmented with results from the terms 'juvenile inflammatory arthritis' and 'juvenile rheumatoid arthritis'.

12. **Networks and linkages have accelerated success in niche areas, such as juvenile inflammatory arthritis (JA), despite lower levels of investment.** Interestingly, JA received the lowest average value of investment per grant (\$0.13M per grant) compared to the overall distribution of funding across all disease areas and had the lowest average value of investment per operating grant among all disease areas (\$0.18M per grant). However, JA received a disproportionate number of network and team grants versus other disease areas, which may have accelerated the impact of research in this area.

#### ***Summary of Key Messages from the Research Funding Database***

##### ***Evolving Landscape:***

- Arthritis research funding is provided by a number of arthritis research funders.
- After a period of growth (2000-2005) arthritis research funding has recently plateaued.
- While IMHA funding has risen faster than other CIHR Institutes, CAN is ending, and arthritis research continues to be underfunded considering the growing prevalence and economic and social burden of arthritis, and compared to other disease areas.

##### ***Balance:***

- Although the number of grants and volume of funding directed to Osteoarthritis was comparable with levels of funding in Rheumatoid Arthritis (highest among arthritis disease subtypes) in 2005-2010, compared with disease prevalence<sup>9</sup> Osteoarthritis remains an area in need of ongoing research investment.
- Most research over the last five years has focused on understanding mechanisms of disease, treatment, and disease management/quality of life: there were fewer projects related to prevention and diagnosis/screening.
- Although arthritis research funding appears stable, the cost of doing research continues to rise, and arthritis as a disease remains underfunded compared to other chronic diseases in terms of economic and social burden.
- The proportional growth in funding for health system, social, cultural and population health research has not been accompanied by increases in training for these areas and may result in decreased capacity in the future if not addressed.
- Funding support may disproportionately emphasize training compared to other stages of the career cycle.

##### ***Research Productivity:***

- Networks and linkages appear to have accelerated success in niche areas, in some cases despite lower levels of investment.
- Juvenile Arthritis (JA) in particular appears to have benefited from the network model.

<sup>9</sup> The prevalence of Osteoarthritis is >10% among Canadian adults, compared with 3% for Gout, and 1% or less for other arthritis disease subtypes according to data presented by PHAC in "Life with Arthritis in Canada: a personal and public health challenge".

# Stakeholder Perspectives

In addition to examining the research and training dollars provided by major funders in arthritis, twenty-five national stakeholders and seven global opinion leaders were interviewed.

## EVOLVING RESEARCH LANDSCAPE

*How is the Canadian Arthritis Funding environment changing and what are the salient overarching trends that merit attention for ensuring Canada's capacity to perform world-class research and achieve impact in Arthritis?*

1. **With the upcoming end of CAN funding and because of increasing competition for research dollars and the increasing costs of doing research, funding levels have become a priority issue for national stakeholders.** Many national stakeholders commented on how CIHR funding has become highly competitive, which represents a particular challenge for all investigators, but especially those in the early stages of their career.
2. **National stakeholders identified key CAN programs/activities that should be maintained following CAN's twilight;** in descending order of importance, these activities included:
  - a) Opportunities for networking and collaboration (e.g. annual meetings that assemble stakeholders across disciplines),
  - b) Training and career development,
  - c) Seed funding for proof-of-principle pilot projects, and
  - d) Opportunities to bring industry and consumers together with researchers.

3. **National stakeholders suggested that the following potential funders be increasingly engaged as important partners and benefactors in funding arthritis research in Canada:**

- Government (Public Health Agency of Canada, Health Canada, and other CIHR institutes, provincial governments),
- Insurance companies,
- Medical device companies,
- Non-health corporations (e.g. banks and other large employers),
- Other NGOs (e.g. the Institute for Work & Health), and
- International funders (e.g. European Union health research funding, National Institutes of Health).

4. Some global opinion leaders strongly believed that Canada must continue to build on CAN's legacy and tradition.

## **BALANCE**

***To what extent is there an appropriate balance of Arthritis research funding in Canada?***

5. National stakeholders' and global opinion leaders' perceptions of the distribution of funding across the CIHR pillars of research – emphasizing biomedical and clinical research, but gradually including health system and social, cultural and population health areas – was broadly consistent with this study's findings. These stakeholders thought that **a key strength for Canada is its broader view of research across these pillars**; moreover, global opinion leaders identified Canada's single-payer health system as a key asset in terms of understanding health accessibility issues, health outcomes and health services/systems research.

6. **Some Canadian stakeholders expressed frustration with the limited availability of funding for health system and social, cultural and population health, particularly in view of reductions to provincial health research budgets.** Additionally, they expressed concern that Canada is now competing with other countries (e.g. United States), which are increasing their investments in comparative effectiveness research.

7. Some global opinion leaders had the impression that funding competitions in Canada had a tendency toward distribution by region rather than the best science. This perception cannot be fully substantiated by the data as, with team-grant funding removed from the analysis, operating grant funding levels are reasonably distributed on a per capita basis across the larger provinces (Ontario, BC, Alberta, Quebec). Smaller provinces (e.g. Saskatchewan and the Atlantic provinces), however, did have lower per capita amounts of funding.

8. **Career development support was broadly recognized as a key asset for Canada and something to be maintained over the longer term.** A number of opinion leaders commented on the importance of funding the first five years of a new investigator's career. Most new investigators identified funding (career support and operating funds) as a key factor influencing their decision to stay in the field and/or establish their careers in Canada, although it was not necessarily the deciding factor. For some new investigators, their entire research pedigree was centred on arthritis and it would not make sense for them to leave the field. However, other stakeholders thought that the community may have created too much capacity and that the current level of investment should be re-evaluated to ensure appropriate support across the career lifecycle of a scientist.

**Researchers viewed large team grants as an important part of the funding milieu,** but in some cases expressed concern that they diminish funding per investigator, and may become inefficient as the team size increases. However, network grants have helped to distinguish Canadian research and tackle complex problems.

## RESEARCH PRODUCTIVITY

*How does Canada's research community perform in terms of publishing leading-edge research compared to international peers?*

9. **Core strengths in RA, OA, JA, spondyloarthritis, gout, pain, osteoporosis, musculoskeletal and psoriatic arthritis, and lupus, which were supported by h-indices from 2000-2009, were recognized by respondents in the national stakeholder interviews.**

## CANADA'S OPPORTUNITY

*How should Canada position itself for continued excellence and to provide global leadership in the area of arthritis research?*

10. **Global opinion leaders and national stakeholders had a fragmented view of Canada's arthritis research landscape.** Opinions were admittedly skewed based on interviewees' own area of expertise and interest. There were a number of identified pockets of research strength across the country, and many of the identified strengths were associated with single individual labs, not multi-institutional groups or centres that could support a strong national profile.
11. **National stakeholders and global opinion leaders recognize Canada's collaborative spirit and view Canada's smaller community of researchers as an advantage, despite large regional distribution across the country.** Virtual networks, however, are not necessarily substitutes for physical centres of excellence. There is a need for further discussion about the advantages and disadvantages of networks vs. centres.



## 12. Key cross-cutting global trends identified by stakeholder interviews were:

- **Prevention or delaying progression/early detection:** Emphasis on population health research to identify potential risk factors (e.g. genes and environment), the investigation of non-medical interventions (e.g. exercise), and improving prognosis and outcomes through the identification of pre-disease or early-stage biomarkers.
- **Regenerative medicine/tissue engineering and biomechanical/bioengineering:** Replacing cartilage through regenerative medicine/cell-based therapies to minimize the need for radical medical interventions (e.g. surgery); the development of assistive devices; and understanding the factors/characteristics of the technology that govern benefit for the consumer/patient.
- **Models of care/knowledge translation:** Accelerating translation of ideas to application (e.g. therapeutics, devices, interventions, models of care) in order to impact the consumer/patient; and understanding health disparities in terms of quality of care provided to various segments of the population, with a focus on equity and access.
- **Pain medication/disease management/quality of life:** Developing better pain medications for OA and RA that are safe and effective for long-term use, and understanding quality of life issues and disease management in arthritis.
- **Research Platforms:** Emphasis on common infrastructure, processes or expertise that can be shared between research groups and accelerate investigations by reducing the need to “re-invent the wheel”. Platforms serve as an important hub for multi-sector collaboration by exchanging academic expertise with industry demands, while introducing industry rigour and standards to academic practices.

## ***Key Messages from Stakeholder Perspectives***

### ***Evolving Landscape:***

- With growing competition for research dollars and increasing costs of doing research, funding levels have become a priority issue for national stakeholders.
- CAN funding created a model for assembling collaborative teams and coordinating funding from other organizations around consensus-driven strategic priorities. As CAN winds down, maintaining the culture of collaboration created through CAN will require additional resources to nurture the development of new teams and continue to leverage funds from external sources.
- The arthritis research community needs to prioritize the engagement of existing and new partners in supporting the cause of arthritis research.

### ***Balance:***

- National stakeholders and global opinion leaders perceived an emphasis on biomedical and clinical research that was gradually encompassing health system and social, cultural and population health areas, and thought that Canada's broader view of research across these pillars was a strength.
- Career development support was broadly recognized as a key asset for Canada and something to be maintained over the longer term. However, some stakeholders felt that the community may have created too much capacity and called for a re-evaluation to ensure appropriate support across the career lifecycle of a scientist.
- Researchers viewed large team grants as an important part of the funding milieu, but in some cases expressed concern that they diminish funding per investigator. Also, while network grants have helped to distinguish Canadian research and tackle complex problems, some stakeholders suggested the possibility of negative impact on the attribution of recognition to individual investigators.

### ***Research Productivity:***

- The perceptions of National stakeholders regarding Canada's areas of strength in research generally reinforced study findings on publication productivity and areas of overlap in funders' areas of focus. However, national stakeholder perceptions were varied with respect to international research performance and productivity.

### ***Canada's Opportunity:***

- The current study suggests significant overlap in funding patterns and no clear consensus on Canada's research strengths.
- There remains an important opportunity to further define and position Canada's global leadership position in arthritis research through targeted investments.
- Although Canada is widely recognized for strength in collaborative research, there is a need for further discussion about the advantages and disadvantages of networks vs. centres, and the appropriateness of network-style programmes for different research areas.
- Five areas of opportunity identified from stakeholder consultations include:
  - Prevention/Early Detection;
  - Regenerative medicine/tissue engineering and biomechanical/bioengineering;
  - Models of care/knowledge translation;
  - Pain medication/disease management/quality of life; and
  - Research Platforms.



# Perspectives vs. Findings

The study authors were interested to note that in some cases stakeholder perceptions of the Canadian research landscape converged with research funding activity tabulated in the study, while in other cases they did not.

## Converging Perceptions:

- National stakeholders and global opinion leaders perceived the distribution of funding across the CIHR pillars of research as emphasizing biomedical and clinical research, but gradually encompassing health system and social, cultural and population health areas.
- The perceptions of national stakeholders regarding Canada's areas of strength in research were similar to study findings on publication productivity and areas of overlap in research funder areas of focus.

## Disparate Perception:

- National stakeholders felt that the availability of Arthritis research funding was declining. Canadian stakeholders expressed frustration with the limited availability of funding for health system and social, cultural and population health, particularly in view of reductions to provincial health research budgets. Yet, the current study identified a plateau in funding levels in recent years. The divergence in perception may partly be due to a downward trend in the average level of funding per research grant. Moreover, the available data has not been analyzed in real (i.e., inflation-adjusted) dollars.

# High-Level Recommendations for the Community of Arthritis Funders

The objective of this exercise was to understand the current state of the arthritis landscape: it was not focused on priority-setting or strategy development. Notwithstanding this objective, data from the landscape assessment report suggest that the Canadian arthritis research funding community runs the risk of spreading itself too thinly across uncoordinated activities and, perhaps most importantly, failing to capitalize on capacity in which it has already invested. What is needed is a bold, focused approach that attracts new partners and helps to define Canada's unique strengths, while sustaining and expanding the collaborative, inter-professional standard Canada has so effectively spearheaded. For maximum impact, the arthritis community must consider:

- ***Developing a collective vision for transformative research centred on big ideas.***

Addressing complex research questions requires a collective vision that brings together national stakeholders and supports interdisciplinary, inter-professional approaches and fosters participation from scientists, engineers, clinician-scientists, physicians, allied health professionals and consumers. Maintaining the culture of collaboration that is so important for big ideas research, and that has been cultivated over the past decade, requires continued emphasis on the process of funding research, on driving strategic consensus, and on developing metrics to measure and communicate success.

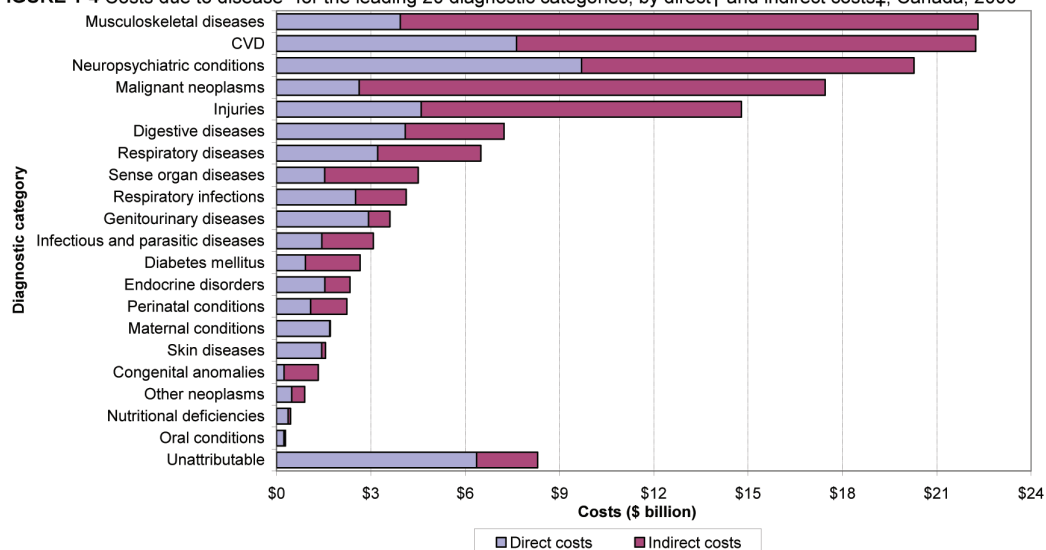
- ***Developing partnerships and working with other chronic disease and therapeutic areas (e.g. aging, other inflammatory diseases, stem cells) in shared areas of interest to advance the arthritis field.***

There are opportunities to reach-out to researchers and funders dedicated to other chronic and autoimmune diseases in an effort to understand mechanisms of inflammation (e.g. other inflammatory diseases, CVD, immunology, HIV), and to integrate research excellence from other fields of expertise in Canada more deliberately into the arthritis research milieu (e.g. genetics, stem cells/regenerative medicine, aging, administrative and linked healthcare databases and patient registries, pain research, children's health).

- ***ACAP Research Committee*** – the Alliance for a Canadian Arthritis Program (ACAP) already serves as an important meeting ground for arthritis stakeholders interested in raising awareness and advocating for change. After CAN, the ACAP Research Committee could serve an important role in monitoring the changing research landscape, liaising and coordinating national strategies between the arthritis research funders, and maintaining a corporate memory for the direction of the overall research strategy.

# Appendix – Referenced Figures and Statistics from the Public Health Agency of Canada

**FIGURE 1-4** Costs due to disease\* for the leading 20 diagnostic categories, by direct† and indirect costs‡, Canada, 2000




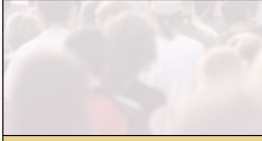
\* Based on the total cost of illness of \$147.9 billion. Expenditures for care in other institutions and additional direct health expenditures are not included.  
 † Direct costs include hospitals, drugs, and physicians.  
 ‡ Indirect costs include mortality, long-term disability, and short-term disability.  
 Notes: - Not all diagnostic categories include short-term disability costs. The six diagnostic categories that include short-term disability costs are CVD, musculoskeletal diseases, neuropsychiatric conditions, digestive diseases, respiratory diseases, and respiratory infections.  
 - Costs by diagnostic category include an unattributable amount of \$6.4 billion for direct costs, and \$1.9 billion for indirect costs (short-term disability only).  
 - Costs by diagnostic category related to suppressed cells for long-term disability are excluded from the total indirect costs.  
 Source: Public Health Agency of Canada, using data from the Economic Burden of Illness in Canada 2000.

**Table 1-3** Projected\* number of individuals aged 15 years and over with arthritis and prevalence of the condition, by sex, Canada, 2007-2031

Year	Men		Women		Total	
	Number with Arthritis	Prevalence	Number with Arthritis	Prevalence	Number with Arthritis	Prevalence
2007	1,627,000	12.5%	2,564,000	19.0 %	4,191,000	15.8%
2011	1,838,000	13.1%	2,922,000	20.2 %	4,761,000	16.7%
2016	2,033,000	13.9%	3,218,000	21.2 %	5,251,000	17.6%
2021	2,232,000	14.6%	3,523,000	22.3 %	5,755,000	18.5%
2026	2,427,000	15.4%	3,827,000	23.3 %	6,254,000	19.4%
2031	2,607,000	16.0%	4,116,000	24.2 %	6,723,000	20.2%

◆ Source: Arthritis Community Research and Evaluation Unit using Canadian Community Health Survey 2007, Statistics Canada. ◆ \* Based on medium population growth scenario.

**Table 6-1** *Economic burden of arthritis, by cost components, Canada 2000 (2008) dollars*

Type of cost	Component	Arthritis costs (\$ million)	Proportion of musculoskeletal disease expenditures (%)
<b>Direct costs</b>			
	Hospital care	\$987.3 (\$1,185.8)	54.0%
	Drug	\$524.6 (\$630.1)	57.8%
	Physician care	\$589.4 (\$707.9)	49.0%
	<b>Total direct</b>	<b>\$2,101.3 (\$2,523.8)</b>	<b>53.4%</b>
<b>Indirect costs</b>			
	Mortality	\$177.9 (\$213.6)	81.4%
	Long term disability	\$4,136.8 (\$4,968.5)	26.4%
	Short term disability	n/a	n/a
	<b>Total indirect</b>	<b>\$4,314.7 (\$5,182.1)</b>	<b>23.5%</b>
<b>Total costs</b>		<b>\$6,415.9 (\$7,705.9)</b>	<b>28.9%</b>

◆ Source: Public Health Agency of Canada, Economic Burden of Illness in Canada 2000 custom tabulations. ◆ Short term disability costs not available for arthritis but included in musculoskeletal disease.



